

Causes of climate change(natural and human)

Natural causes(Changes in the Earth's orbit and angle of tilt,sunspot occurrences,large-scale volcanic eruptions)

Human causes(Burning of fossil fuels,changing land use)

Natural causes:

Changes in the Earth's orbit:The Earth's orbit shifts from circular to elliptical and back.When most elliptical,Earth travels in an oval path,receiving more solar radiation at its closest approach than at its farthest point.For example,Earth's orbit shifts from circular to elliptical every 100,000 years,affecting seasonal solar energy levels.

Earth tilt:The Earth's axis tilts between 21.5° and 24.5°.When tilt decreases,hemispheres lean further from the Sun,causing warmer winters,cooler summers,and allowing ice sheets to build,cooling the Earth.For example,the Earth's tilt changes every 41,000 years.

Sunspot occurrences:Higher sunspot activity is linked to increased solar radiation. Though sunspots are cooler, areas around them emit more energy, raising Earth's temperatures. Periods of maximum sunspots generally align with warmer surface temperatures on Earth, following an 11-year cycle.

Large-scale volcanic eruptions:Volcanic eruptions release carbon dioxide,water vapor,sulfur dioxide,dust,and ash into the atmosphere.Sulfur-based particles,dust,and ash spread,reflecting solar energy back into space,temporarily cooling Earth.For example,Mount Pinatubo's 1991 eruption lowered global temperatures by 0.6°C for 15 months.

Human causes:

Burning fossil fuels:Fossil fuels, rich in carbon, release carbon dioxide and other greenhouse gases when burned, enhancing the greenhouse effect.They power activities like agriculture,industry,and urbanization.Since the 1880s industrial revolution,fossil fuel use has surged,now contributing over 35 billion tonnes of carbon dioxide emissions yearly.

Changing land use

Deforestation:Large-scale deforestation for agriculture,industry,and urbanization enhances the greenhouse effect.Forests are cleared for resources (timber) and land use,reducing carbon dioxide absorption by trees.Cutting or burning trees releases stored carbon,while exposed soil increases carbon dioxide through oxidation.For example,tropical deforestation contributes roughly 20% of global greenhouse gas emissions.

Agriculture:As populations grow,forests are cleared for agriculture,contributing about 30% of global greenhouse gas emissions annually.Key factors include burning fossil fuels for machinery,nitrous oxide

from fertilizers, and methane from livestock and decomposition. For example, paddy rice fields contribute 5-20% of global methane emissions due to rapid decomposition.

Industries: Industries burn fossil fuels for energy in manufacturing, transport, power, and mining, causing 43% of global greenhouse gas emissions. Factories making goods like cement and steel release carbon dioxide from burning coal and gas. Transporting goods with trucks, ships, and planes also adds emissions, while power plants and mining activities contribute further contribute to global warming.

Urbanisation: In cities, fossil fuels power vehicles and household activities like heating, cooling, and lighting. For example, cities consume 78% of global energy and significantly contribute to greenhouse gas emissions.

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Impacts of climate change(natural and human systems)

Natural systems(Increase in atmospheric and ocean surface temperatures, changes in ocean circulation, changes in precipitation on land)

Aquatic ecosystems (Threats to coral reefs, ocean acidification, disruption of marine food webs)

Terrestrial ecosystems (Threats to flora and fauna, changes in extreme weather including droughts and excessive rainfall)

Natural systems

(A)-Increase in atmospheric and ocean surface temperatures: Most of the heat trapped by greenhouse gases is absorbed by oceans. This results in increase of average ocean temperatures. The Earth's average surface temperature has increased by approximately 1.1°C since the late 19th century. Higher temperatures reduce crop yields by shortening growing seasons, this can cause food shortages. Sea surface temperatures have increased by about 0.13°C per decade since 1901. Oceans have absorbed over 90% of excess heat from global warming. Warmer waters disrupt fish breeding, migration, and feeding, leading to smaller catches. (LEADS to point D)

(B)-Changes to ocean circulations: Climate change is expected to slow down the global ocean circulation, water at the surface gains heat due to rising atmospheric temperatures and becomes less dense. The sinking of water at the poles is thus reduced which slows down the flow of water. For example, the ocean current in the Atlantic Ocean has slowed by about 15%, the Atlantic cod rely on cold, nutrient-rich waters for spawning and feeding. A slowdown could warm their habitats, reducing population size and distribution. Increasing food shortages in some parts of the world.

(C)-Changes in precipitation on land: Climate change alters precipitation patterns, causing wet regions to become wetter and dry regions to become drier. Increased evaporation in warmer, wetter areas increases atmospheric water vapour, leading to heavier rainfall. For example, Bangladesh is a low-lying country prone to heavy monsoon rains and flooding. Climate change causes Bangladesh to experience more floods. In contrast, warmer temperatures in dry regions enhance evaporation, reducing surface water and soil moisture, resulting in increased drought frequency and worsening dry conditions. For example, Egypt is mainly a desert country with little rainfall, relying on the Nile River for water and

agriculture. Climate change will result in Egypt experiencing more droughts. (**LEADS TO DIRECT IMPACTS TO HUMAN SYSTEMS POINT B AND C**)

Aquatic ecosystems

(D)-**Threats to coral reefs**: Increased ocean temperatures from climate change can cause algae to leave corals, leading to bleaching and a higher risk of coral death. Coral reefs provide habitats and food for millions of marine species, like fish and sea turtles. When corals die, these species lose their sources of food and shelter, disrupting the entire ecosystem. For example, the Great Barrier Reef in Australia was severely affected into 2016 and 2017 due to rising sea temperatures, up to two-thirds of corals die in the northern section of the reef, species diversity subsequently decreased. (**Effects of point A**)

(E)-**Ocean acidification**: Oceans are important natural carbon sinks due to the presence of phytoplanktons which absorb carbon dioxide when they photosynthesise. The increase of carbon dioxide emissions leads to increase in ocean acidity. Carbonic acids dissolve calcium carbonate which is needed by aquatic organisms such as corals to form their skeletons. At this rate, coral reefs are eroding faster than new corals can form. This can cause species that depend on them for food, habitat and shelter from predators to be negatively affected and may potentially go extinct. For example, average coral cover in the Great Barrier Reef has dropped to about 30% of what it was in the 1960s, in part due to ocean acidification. As the rate of ocean acidification increases, more marine species might die off due to lack of food or no place to hide from predators which results in death. (**Leads to point D, impacts of point A**)

(F)-**Disruptions of marine food webs**: Increase in ocean surface temperature, altering the geographic distribution of aquatic species. Warming oceans force species to migrate to cooler areas, such as poleward or into deeper waters. Equatorial regions will see a decline in biodiversity, while polar regions will experience an increase. For example, tropical species such as parrotfish and rabbit fish have migrated polewards. A study found that diversity for species in tropical waters has dropped significantly in the last 50 years. Thus, there will be a change in composition of aquatic ecosystem which might result in food shortages in some parts of the world.

Terrestrial ecosystems

(G)-**Threats to flora and fauna**: Climate change increases atmospheric temperatures, causing terrestrial species to migrate toward higher latitudes and altitudes where it's cooler. For example, about 170 species of birds tracked in North America have expanded their range northwards by 50km on average during the past 4 decades and temperate forests are advancing northwards and replacing boreal forests, while boreal forests are advancing northwards into the tundra. This disrupts terrestrial ecosystems as mountain species that prefer cold environments may have no place to go if the mountain top is too warm for them. They will compete with species moving upward, increasing extinction risks. Plants unable to adapt or migrate will also decline.

(F)-**Impacts of droughts on flora and fauna**: Plants are vulnerable to droughts as they cannot move for water, leading to wilting and death. Weakened plants are more susceptible to diseases and pests. For instance, California's drought from 2012 to 2016 killed 102 million forest trees due to water shortages and disease. Tree deaths harm habitats and reduce food supplies. Droughts force animals to seek new sources of water and food, potentially spreading diseases like botulism and cholera. In California, the drought dried

up wetlands, causing deaths among insects, fish, plants, and birds. Thousands of ducks and geese crowded the remaining wetlands, spreading cholera and leading to significant biodiversity loss.

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Human systems[Direct and indirect impacts]

Direct impacts are extreme weather events like heat waves, droughts, floods, tropical cyclones and wildfires.

Indirect impacts: affecting provisioning ecosystem services(food), regulating ecosystem services(disease regulation) and cultural ecosystem services(melting of arctic ice and degradation of natural landscapes)

Direct impacts:

(A)-**Heat waves:** They are a prolonged periods of extreme heat, often exceeding 40°C. Climate change makes these events more intense and frequent, causing heat strokes, breathing difficulties, and thousands of deaths globally. High temperatures also reduce soil moisture, leading to crop failures and affecting food supplies. For example, the 2003 heat wave in Europe resulted in around 70,000 deaths over two weeks. It also harmed wheat harvests, driving up bread prices and making food less affordable.

(B)-**Droughts:** It occurs when regions experience prolonged lack of precipitation, causing water shortages. Warmer temperatures from climate change increase evaporation, drying out soil and vegetation. In dry areas, such as subtropics, dry seasons worsen, raising drought frequency. Droughts lead to clean water shortages, dehydration, and death, while also reducing water for crops, causing crop failures, food shortages, and malnutrition. For example, the 2018-2019 drought in Afghanistan impacted over two-thirds of the country, affecting more than ten million people due to food shortages and displacing many.

(C)-**Floods:** Climate change increases flood risk by causing heavy rainfall, snowmelt, and rising sea levels. Floods lead to deaths, property damage, homelessness, and economic losses. They also contaminate water supplies, spreading diseases like cholera. For example, in 2020, severe monsoon flooding in Bangladesh killed 260 people, destroyed 1.3 billion homes, and caused millions in agricultural losses, heavily affecting the developing country.

(D)-**Tropical cyclones:** Tropical cyclones form over warm oceans, and climate change intensifies them. They cause flooding, landslides, deaths, and damage to infrastructure. Strong winds, heavy rain and storm surges brought by it destroy buildings and crops, leading to economic losses and food insecurity. For example, Typhoon Goni, the strongest to hit the Philippines, caused major destruction through strong winds and heavy rainfall, evacuating nearly a million people and causing \$36 million in crop damage. The country's infrastructure couldn't handle the flooding, and recovery was difficult before another cyclone hit.

(E)-**Wildfires:** They are uncontrolled fires in forests or grasslands. Climate change creates warmer, drier conditions, making wildfires easier to start and harder to control. They cause suffocation, injuries, and burns. Wildfires release carbon dioxide, carbon monoxide, and fine particulate matter, leading to air pollution, respiratory illnesses, and deaths. For example, the 2019-2020 wildfires in Australia spread widely due to hot, dry conditions from climate change. Air quality in Sydney was 11 times greater than what is set

as a hazardous level. The fires caused 34 deaths, destroyed thousands of buildings, and led to widespread homelessness.

Indirect impacts:

(A)-Affecting provisioning ecosystem services: Climate change affects provisioning ecosystem services, threatening food production and security. Rising ocean temperatures and acidity harm fish populations, forcing species to migrate and impacting those who rely on fisheries for income. For example, In Cambodia's Tonle Sap Lake, fishing is vital for local communities for income. Climate change has increased temperatures and caused unpredictable rainfall, lowering water levels and fish availability. Higher temperatures also increase forest fire risks, destroying fish habitats and threatening Cambodians' livelihoods and food security.

However, Climate change can positively impact provisioning ecosystem services in some areas. Higher latitude regions may benefit as fish migrate to cooler waters, allowing fisheries to catch a more diverse range of seafood. For example, in recent years, fishermen in Portugal have begun to catch new species, which were previously found in warmer regions.

It also affects the crop yields. Climate change increases the severity and frequency of extreme weather events, making it harder for crops to survive and reducing food production. For example, the 2020 drought in Thailand led to insufficient rain and a shorter monsoon season, drying up reservoirs and leaving land barren, which prevented farmers from growing crops. This severely impacted Thailand, where agriculture uses 70% of the nation's water supply, greatly affecting farmers' livelihoods.

Climate change impacts to the provisioning ecosystem services are unevenly experienced. Declining food production raises prices, affecting the poor and increasing the risk of malnutrition and starvation. Sub-Saharan Africa and South Asia, the world's poorest regions, are especially vulnerable to food insecurity.

(B)-Affecting regulating ecosystem services: Climate change alters the environment, affecting regulating ecosystem services and increasing disease spread. Warmer temperatures enable vectors like mosquitoes and ticks to move to higher latitudes and altitudes, raising the risk of vector-borne diseases. This leads to higher mortality, reduced economic productivity as people cannot work, and increased healthcare costs. For example, before 2018, mosquitoes were absent in Bhutan's mountains due to cold temperatures as they cannot breed there. However, in 2019, Bhutan faced its first dengue epidemic, with many areas reporting cases.

(C)-Melting of Arctic ice: Climate change is melting Arctic ice, disrupting indigenous cultural practices. Traditional food storage in ice cellars is threatened, and the decline in sled dogs, vital for travel and hunting, impacts their culture.

(D)-Degradation of natural landscapes: Climate change degrades natural landscapes, harming tourism. Sea level rise threatens low-lying islands like the Maldives, and coral bleaching reduces tourist attractions. This leads to fewer visitors and lower revenue. Cultural services are also impacted as provisioning and regulating ecosystems decline.

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Climate action(Mitigation and adaptations)

Mitigation strategies(International agreements and cooperation,use of low-carbon technologies,use of clean energy sources,changes in consumption patterns)

Adaptation strategies(Structural approaches,technological approaches,social approaches,institutional approaches)

Mitigation:

International agreements and cooperation:The United Nations Framework Convention on Climate Change (UNFCCC) is a global treaty focused on addressing climate change.Its main goal is to stabilize greenhouse gas emissions to prevent irreversible human impacts and give ecosystems enough time to adapt naturally.

-Developed,industrialized countries bear greater responsibility under the UNFCCC as they are the main contributors to past and current greenhouse gas emissions.They are expected to lead in reducing emissions.

-Developed countries provide financial support and technology to help developing nations with climate action, enabling them to mitigate and adapt to climate change.

-Countries must regularly report their climate policies and greenhouse gas emissions to monitor progress on climate change efforts.

The Conference of Parties (COP) members meet annually to review progress and make decisions on climate action, aiming to reduce greenhouse gas emissions effectively.For example,in 2015,the COP made significant progress with the Paris Agreement,a legally binding international climate treaty. Adopted by 191 parties,it requires each country to set and meet its own climate targets and measures.

Limitations:The convention's implementation depends on the commitment of its parties,which varies due to different national priorities.For example,in 2017,President Donald Trump announced that USA,would withdraw from the Paris Agreement,arguing it would harm the economy.Contributions to reduce emissions are not legally binding,and no legal action can be enforced if a party refuses to act or increase its commitment.

Use of low carbon technologies:Low-carbon technologies emit minimal greenhouse gases.An example is Carbon Capture,Utilization,and Storage (CCUS).Carbon Capture involves separating and capturing CO₂ from power plants and industrial sources.Once captured,the CO₂ is either stored long-term to prevent it from reaching the atmosphere like in a ocean(carbon storage) or used as a raw material to create products like cement,which can be sold for profit (carbon utilization).For example,on a global scale,it's estimated that current carbon capture,utilization,and storage (CCUS) facilities collectively capture about 40 million tonnes of CO₂ annually.

Limitations:It is costly and relies on public funding and subsidies for private research(**economic**).

There are also concerns about potential carbon leakage from storage sites over time(**technological**).

Use of clean energy sources:Clean energy comes from renewable sources that don't emit greenhouse gases or pollute the air when used.

Solar energy:Solar energy is converted into thermal or electrical energy and is the cleanest,most abundant renewable energy source available.As of 2023,it generated about **1,200 terawatt-hours(TWh)**.

Hydro-electric power:Hydropower plants generate electricity by harnessing the energy of flowing water, typically from rivers.As of 2023,it generated roughly **4,500 terawatt-hours(TWh)**.

Geothermal:Geothermal energy comes from heat within the Earth's crust,where hot rocks heat

groundwater, creating steam that is used to generate electricity. As of 2023, it generated approximately **200 terawatt-hours (TWh)**.

Nuclear: Derived from the splitting up of radioactive atoms. This process generates heat which produces steam and is used to harness to generate electricity. As of 2023, it generated around **2,500 terawatt-hours (TWh)**.

Limitations: Renewable energy technology development and construction are costly and often reliant on government policies and financial support to be cost-competitive. For example, in Indonesia, the cost of installing a solar system ranges from USD 900 to 1,300 per kW, leading to solar energy contributing only 1.7% of the country's total electricity in 2019 (**economic**).

Changes in consumption patterns (Food choices, food waste, use of plastics, fashion): Household consumption contributes to our carbon footprint because greenhouse gases are emitted during the production and transportation of goods.

Food choices: Food production accounts for over a quarter of greenhouse gas emissions. Adopting a plant-based diet by eating less meat and more vegetables can help reduce agricultural emissions. Additionally, purchasing local produce minimizes transportation needs, resulting in lower carbon emissions. For example, producing 1 kg of beef generates approximately 40.2 kg of CO₂ equivalent emissions whereas vegetables like beans produce about 0.8 kg of CO₂ equivalent emissions per kilogram. Beef production generates about 50 times more emissions than beans.

Food waste: When food rots in landfills, it produces methane, which is a greenhouse gas that contributes to climate change. For example, in 2020, landfills contributed approximately 79 million metric tons of methane. To minimize waste, people should only buy what they need and make shopping lists to avoid overbuying. Additionally, food waste can be repurposed. For example, used coffee grounds can serve as a fertilizer for plants.

Use of plastics: Greenhouse gases are emitted during the production, recycling, and incineration of plastics, as well as from their long degradation periods. To mitigate this, individuals can refuse single-use plastics and opt for reusable products. Being informed about proper recycling methods can also help reduce plastic waste entering incinerators, landfills, and oceans. In 2023, the production and disposal of plastics are estimated to contribute approximately 1.8 billion metric tons of greenhouse gases worldwide.

Fashion: Production of apparel production significantly contributes to greenhouse gas emissions due to high energy and water usage. Increased consumer demand for rapid design changes leads to more production, further increasing emissions. We can ask if the manufactures use sustainable criteria to make the clothing, repair or upcycling old clothing, donate what we no longer use, buy only what we need and opt for second-hand clothing when possible to reduce greenhouse gas emissions.

Limitations: Changing people's mindsets and consumption habits takes considerable time (**social**). For example, despite having access to drinkable tap water, Singaporeans consumed over 467 million bottled water bottles in 2018, as many view tap water as unclean, making bottled water a convenient choice.

Changing consumption patterns relies not only on consumer behavior but also on companies' commitment to altering the resources used in production. However, companies may be reluctant to change due to concerns about profit loss, leading to practices like greenwashing, where they promote themselves as environmentally friendly without making substantial changes. (**economic**)

Adaptations:

Structural adaptation:Involves building physical structures for water and flood control. **Seawalls:**A sea wall is built along the coast to stop the sea from advancing onto the land,protecting people,property,and ecosystems from coastal flooding.For example,sea walls at East Coast Park,Singapore,help guard the coastline against rising sea levels.

Polder:A polder is a low-lying area surrounded and protected by dykes,with excess water pumped out.It helps protect people,properties,and the environment from sea level rise and coastal floods.The Netherlands has used polders since the 12th century to protect communities from river and sea flooding.

Water storage tanks:Infrastructure like detention tanks stores excess stormwater during heavy rainfall,slowing its flow into drains and preventing floods.For example,Singapore's Stamford Detention Tank temporarily stores excess water and releases it into drains once water levels drop.

Limitations:Building structures like sea walls and polders to protect against flooding is expensive,especially for developing countries.They require regular monitoring and upgrading to address rising sea levels due to climate change.In Fiji,even with the use of local materials,sea walls are costly and labor-intensive,increasing the overall expense(**economic**). The construction of these structures can lead to the eviction of informal communities,who may resist as they might not have anywhere suitable to go to.For example,in cities like Jakarta and Bangkok,informal settlements have been displaced to make way for flood protection projects,leaving large communities with few suitable relocation options(**social**).

Technological adaptation:Produce food to help communities stay food secure despite changing climate conditions, enhancing both food security and resilience.

High-tech vegetable farms:Crops can be monitored remotely to ensure optimal growing conditions, allowing for faster vegetable harvests.As of 2023,Singapore has 15 high-tech vegetable farms,producing approximately 5,000 metric tons of vegetables annually. **High-tech egg farms:**Egg checks can be automated, allowing for quicker inspections and enabling staff to focus on other farm tasks.As of 2023,Singapore has 5 high-tech egg farms which produce around 1.3 million eggs annually.

High-tech fish farms:High-tech water tanks can monitor water quality and detect fish diseases,allowing for quick intervention to prevent disease spread.As of 2023,Singapore has 20 high-tech fish farms,collectively yielding about 10,000 metric tons of fish per year. These technological advancements enable efficient production of high-quality food, enhancing Singapore's food security.

Limitations:They can be expensive,making them difficult to implement in countries with limited funding.(**economic**)

Social adaptation:It involves educating communities on responding to climate change impacts,raising awareness of warning signs of possible climatic hazards,and taking appropriate protective steps,thereby enhancing community resilience.For example,in Singapore,the public is educated on preventing heat stress during hot weather.For example,during warm periods,people are advised to stay hydrated and watch for early signs of heat stress,reducing injuries and minimizing economic losses.

Limitations:People may not be willing to change their behaviour for various reasons.For example,in Nepal,some communities prefer traditional adaptations like temporary migration to find employment during droughts and are reluctant to adopt new methods such as growing drought-resistant crops to cope with prolonged drought.

Institutional adaptations(National and regional policies):Organise strategies on a national or regional scale enable larger measures that would be difficult for communities to implement alone,due to limited resources,expertise, or funding.

National policies: Singapore has organisations to coordinate climate action. For example, the Ministry of Sustainability and the Environment (MSE) leads efforts to make Singapore more climate-resilient, developing a national framework for climate resilience. The Centre for Climate Research Singapore (CCRS) conducts research on climate science to support Singapore's climate resilience planning.

Regional policies: The Association of Southeast Asian Nations (ASEAN) Cooperation on Environment safeguards Southeast Asia's interests. Strategies like the ASEAN Climate Outlook Forum enable countries to collaboratively develop climate outlooks, allowing them to better manage and adapt to climate risks.

Limitations: Countries may have competing national priorities such as urgent priorities, like development projects, and might not be able to allocate funds from their national budgets for adaptation efforts.

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Growth of tourism(Motivation to travel,ability to travel and mobility in travel)

Motivation to travel(Need for relaxation,need to achieve personal growth and self-fulfilment,need to discover unique travel experiences)

Ability to travel(Increase in disposable incomes,increase in leisure time,business innovations in the tourism-related industry,lower transport costs,lower accommodation costs)

Mobility to travel(Expansion of public transport services and infrastructure,introduction of new modes of travel,increase in private car ownership)

Motivation to travel(increased due to globalisation):

Need for relaxation: Work pressures and busy lifestyles have increased the desire to travel for stress relief. Many now view travel as a way to rest and rejuvenate, seeking nature and scenic views to escape urban life. A survey found that a key reason British tourists visit Phuket, Thailand, known for its scenic beaches, is to rest and relax.

The need to achieve personal growth and self-fulfilment: People see travel as a way to grow and achieve their potential. It helps them learn new things or improve existing skills. Many also pursue challenging activities like mountain climbing or skydiving to push their physical and emotional limits, leading to personal growth. For example, in recent decades, the number of tourists climbing Mount Everest has risen steadily, driven by the desire to challenge themselves and reach their full potential.

The need to discover unique travel experiences: Some people travel to satisfy their curiosity and gain unique experiences by exploring less-known environments and cultures. They often seek remote places that are less frequented. Globalization and improved transport networks have made remote areas more accessible, increasing tourism in these unique destinations. For example, tourism in Antarctica has surged over the past two decades, with many visitors eager to explore one of the world's last uninhabited regions and satisfy their curiosity.

Ability to travel:

Increase in disposable incomes:After World War II,economic development increased disposable incomes in North America,Western Europe,and Japan,leading to higher travel spending and tourism growth.Today,a growing middle class in rapidly developing countries like China and India is driving significant demand for tourism.In China,(Gross Domestic Product)GDP growth led to a surge in international tourism,with departures increasing from 9 million in 1999 to 154 million in 2019.

Increase in leisure time:Leisure time is the period when individuals are free from work.Since the 1950s,many countries have increased leisure time through more paid leave,additional public holidays,and shorter workweeks,enabling more travel opportunities and enhancing workers' ability to afford trips.For example,in 2015,the Chinese government encouraged employers to provide workers with half a day of paid leave on Fridays during summer to promote domestic tourism.

Business innovations in the tourism-related industry:Business innovations have made travel more accessible and affordable,increasing tourism demand.For example,websites like Expedia and Trivago allow travelers to compare reviews and prices,enabling direct trip bookings.They often feature promotional rates for transport and accommodation.

Lower transport costs:International tourism heavily depends on air transport,which has become more affordable due to falling fares,especially with the rise of budget airlines.These airlines offer significantly lower ticket prices by using fuel-efficient planes and flying to airports with lower fees,reducing transport costs for international travel.For example,budget airlines like AirAsia have gained popularity for affordable travel within Southeast Asia.

Lower accommodation costs:The variety of accommodations has expanded over the years,ranging from rented properties to hotels and bed-and-breakfast stays.Innovations like Airbnb allow property owners to rent out their spaces at various price points.This diversity caters to different budgets,making travel more affordable.For example,in 2019,over two million people stayed in an Airbnb property daily.

Mobility in travel:

Expansion of public transport services and infrastructure:In recent years,more countries have been building transport infrastructure like roads,railways,and airports,improving connectivity both within and between countries.This allows tourists to reach more places in less time.For example,the opening of Changi Airport's Terminal 4 has increased flight capacity from various parts of Asia to Singapore,making regional travel more convenient.

Introduction of new modes of travel:Advancements in transportation technology have introduced faster and more efficient travel options.Tourists can now travel greater distances in shorter times by land, sea, and air.For example,in 1965,a conventional train from Tokyo to Osaka took 6 hours and 40 minutes.With the introduction of the Shinkansen (bullet train),the journey was reduced to 3 hours and 10 minutes,greatly boosting travel between cities connected by the Shinkansen network.

Increased private car ownership:Private car ownership allows families to travel comfortably to nearby attractions for leisure.It provides freedom in choosing destinations and time spent at each stop.The rise in car ownership has boosted domestic tourism.For example,in the 1950s,private car ownership in the U.S.

surged, leading to a rise in domestic tourism. As families traveled by car, the hotel and motel industry expanded rapidly to meet the growing demand.

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Impacts of tourism(Economic,social and environmental)

Positive economic impacts(Employment opportunities in formal and informal tourism sectors,income generation from tourists' spending on consumer goods and service)

Negative economic impacts(Economic leakages resulting in less tourism revenue,overdependence on tourism,which increases vulnerability to a sudden fall in tourist numbers)

Positive social impacts(Cultural preservation,enhancing cultural ecosystem services)

Negative social impacts(Commodification of cultural rituals and art forms,cultural clashes,rise in crimes)

Positive environmental impacts(Conservation of natural environment and preservation of biodiversity,restoration of degraded aquatic and terrestrial ecosystems)

Negative environmental impacts(Pollution,depletion of natural resources and threats to wildlife habitats)

Positive economic impacts:

(A)-Employment opportunities in formal and informal tourism sectors: Tourism creates many jobs. Formal roles like hotel receptionists, have fixed hours and contracts. Informal roles, like street performers, have irregular hours and no contracts. Therefore, tourism can lower national unemployment rates. For example, in 2019, tourism provided 330 million jobs, about 10% of the global workforce. From 2015 to 2019, it created 25% of new jobs.

(B)-Income generation from tourists' spending on consumer goods and service: Tourism increases income for locals and governments. Tourists spending on local goods and services like accommodation and food boosts local earnings, and taxes provide government revenue for infrastructure, education, and healthcare, improving living standards. It also helps reduce poverty by transferring wealth to poorer regions. For example, in the 1980s, Maldives was one of the world's poorest nations. Today, its economy has grown significantly due to tourism from its natural landscape, resulting in low poverty rates.

Negative economic impacts:

(C)-Economic leakages resulting in less tourism revenue: Tourism revenue is lost to other countries when businesses import goods and services, reducing local income and government revenue, limiting improvements to living standards. For example, according to the United Nations Environment Programme, for every US\$100 spent by a tourist on a holiday to a developing country, only US\$5 remains in the local host community.

(D)-Overdependence on tourism, which increases vulnerability to a sudden fall in tourist numbers: Unexpected events can cause tourism income to fluctuate, impacting people's livelihoods. Such events are **natural disasters, unfavourable political situations, economic downturn and outbreak of diseases.**

Natural disasters like earthquakes can damage tourism infrastructure, leading travelers to postpone or cancel their plans due to safety concerns. For example, in 2017, powerful hurricanes struck the Caribbean, destroying 95% of buildings, leading to one million fewer tourist arrivals and over \$700 million lost in revenue.

Unfavourable political situations: It can cause riots and protests, leading to hotel and attraction closures. Safety concerns may prompt travelers to postpone or cancel trips. Governments might close affected areas or issue travel advisories, reducing tourist arrivals. For example, in 2020, protests against military rule in Thailand led several countries to issue travel advisories to dissuade them from travelling there, reducing tourist arrivals.

Economic downturn: Countries' economies suffer. Companies cut costs, leading to job losses and pay cuts, which reduce disposable income and discourage travel. For example, in 2009, the Maldives, heavily reliant on tourism, experienced a 4% drop in arrivals due to the global economic crisis.

Outbreak of diseases: It may lead people to postpone or cancel travel due to safety concerns. Governments might close affected areas or issue travel advisories to discourage travelling to the affected area to ensure safety, reducing tourist arrivals. For example, the COVID-19 pandemic, starting in 2019, infected over 205 million people and caused over 4 million deaths. Countries implemented lockdowns, halting international travel. In the first half of 2020, global tourist arrivals fell by over 65%. In the Maldives, arrivals in 2020 were about one-third of 2019.

Positive social impacts:

(A)-Cultural preservation: Tourism revenues boost the local economy and encourage the protection of traditional cultural practices and art forms. Authorities may invest in museums or provide grants to enhance their appeal to tourists. This fosters preservation efforts and strengthens locals' community ties, ensuring cultural knowledge is passed down through generations. For example, shadow puppetry in China is an ancient art form that is vital to local communities, passing on history and traditions. With growing tourist interest, innovations like Virtual Reality (VR) shows have emerged, helping to revitalize and sustain the art.

(B)-Enhancing cultural ecosystem services: Protecting the environment for tourism enhances cultural ecosystem services, providing locals and tourists with aesthetic, educational, recreational, and spiritual benefits. For example, in Sanjiangyuan National Park, rare snow leopards attract tourists. Villagers in Angsai village offer community-based tourism, where visitors can stay with locals and view the leopards. The park provides aesthetic benefits from its beauty, educational opportunities about conservation, recreational activities like hiking, and spiritual connections for Buddhist locals who view the mountains and leopards as sacred.

Negative social impacts:

(C)-Commodification of cultural rituals and art forms: As heritage tourism rises, traditions may become commodified, losing authenticity and cultural value. Rituals might be exaggerated to suit the needs and requests of tourists, and art forms may be mass-produced, leading to conflict among locals with some supporting tourism and others fearing the loss of cultural authenticity. For example, in Vancouver, totem poles have been commodified and are often sold as souvenirs. However, many of these items are inauthentic, created without input from native tribes. This leads to tension between locals who rely on souvenir sales for income and those who feel their culture is being diluted.

(D)-Cultural clashes: Tourists can disregard local customs and traditions, leading to cultural clashes and negative sentiments. Additionally, tourism can cause congestion and pollution, further fostering negative

attitudes toward tourists. For example, in Hawaii, many locals opposed reopening to tourists after COVID-19 lockdowns, as visitors often ignored safety guidelines like wearing of masks properly and showed little respect for indigenous Hawaiian culture. Some locals may feel tourism threatens their identity and raises their living costs.

(E)-Rise in crimes: Crime rates like pickpocketing may rise in tourist areas, with tourists becoming targets due to carrying valuables. Negative local sentiment can also lead to tourists being targeted, making locals feel less safe. For example, in 2017, anti-tourist protesters in Barcelona, Spain, attacked a tourist bus, puncturing its tires and spraying anti-tourism graffiti.

Positive environmental impacts:

(A)-Conservation of natural environments and preservation of biodiversity: Local communities and governments maintain a pristine environment to attract tourists. Tourism revenue may fund biodiversity protection by establishing protected areas, training staff to manage ecosystems, and running environmental education programs for tourists. The Galapagos National Park in Ecuador charges a US\$100 entrance fee, which helps fund park conservation, maintenance, and hiring of park rangers.

(B)-Restoration of degraded aquatic and terrestrial ecosystems: Aquatic and terrestrial sites can become tourist attractions, encouraging restoration efforts like reforestation to reverse degradation and create new parks. For example, in Mauritius and Seychelles, coral reefs suffer from overfishing, unsustainable practices and improper waste disposal. Despite this, they are crucial for local livelihoods and tourism. A United Nations Development Fund project has been launched to restore the coral reef ecosystem.

Negative environmental impacts:

(C)-Pollution: Tourism can result in pollution due to greenhouse gas emissions. Traveling by air, sea, or land burns fossil fuels, producing significant greenhouse gases. Tourism services, like air conditioning and accommodation can also further lead to greenhouse gas emissions. These gases can cause respiratory issues such as asthma and often spread over large areas, affecting distant regions. For example, from 1990 to 2019, U.S. aviation CO₂ emissions increased by 24% due to rising air travel demand.

Tourism can also result in pollution due to inadequate sewage facilities and improper waste disposal.

Inadequate sewage facilities: The tourism industry generates significant waste, especially in areas lacking proper waste disposal. Tourists may leave litter, causing environmental degradation, such as land and water pollution. For instance, climbers on Mount Everest often discard tents, food containers, and human waste, contaminating soil and groundwater.

Improper waste disposal: Many tourist accommodations lack proper sewage systems, such as wastewater treatment facilities. As a result, untreated sewage is often improperly disposed of in the sea, leading to water pollution. Boracay Island in the Philippines, a popular tourist destination, has over 200 local businesses, including accommodations, that lack connections to the underground sewage system. Consequently, untreated sewage is directly dumped into the sea, degrading water quality and threatening aquatic ecosystems.

(D)-Depletion of natural resources: Tourism can lead to excessive water use, depleting natural resources and causing environmental issues like droughts, which harm both people and ecosystems. For example, Bali's tourism uses around 3 million liters of water daily, depleting local rivers and reducing water

for residents and ecosystems. This increased demand has raised water prices, making farming less profitable and threatening local farmers' livelihoods.

(E)-Threats to wildlife habitats: Tourist facility construction can invade natural areas, harming environments and wildlife habitats. Tourists may trample plants or create noise that disturbs animals. For example, in the Maldives, large-scale facilities built for tourism like accommodation, food and recreation threaten coastal environments. During construction, rock and sand are dumped into the sea, smothering corals. Newer resorts show a lack of large corals, leading to habitat loss for marine animals like reef sharks that rely on the reefs for food and shelter.

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Sustainable tourism development(economic,social,environmental)

Economic:

Continual provision of employment opportunities and income growth: The tourism industry must prioritize providing stable employment and income for locals by offering skills training for career growth. This training can help locals gain diverse skills, allowing them to find work during off-peak seasons and ensuring long-term economic sustainability. For example, Tourism creates many jobs. Formal roles like hotel receptionists, have fixed hours and contracts. Therefore, tourism can lower national unemployment rates. For example, in 2019, tourism provided 330 million jobs, about 10% of the global workforce. From 2015 to 2019, it created 25% of new jobs.

Increased provision of social services that raise standards of living amongst locals: The Gorilla Trekking experience in Volcanoes National Park shows (CBT) in Rwanda. Local communities actively participate as guides and offer services like homestays and cultural activities. This involvement has generated significant income, which supports community development projects, including schools and healthcare facilities providing social services to the locals.

Social:

Respect authenticity of local communities, practices and art forms: When traditional practices and art forms are respected, they remain meaningful for both local communities and tourists. This fosters their ongoing practice and preservation by locals, promoting social sustainability. For example, shadow puppetry in China is an ancient art form that is vital to local communities, passing on history and traditions. With growing tourist interest, innovations like Virtual Reality (VR) shows have emerged, helping to revitalize and sustain the art.

Contribute to intercultural understanding and tolerance: Exchanges between tourists and locals should foster understanding and appreciation of each other's cultures. This mutual respect enhances the significance of local cultures for both groups, promoting their continued practice and preservation, which supports social sustainability. For example, shadow puppetry in China is an ancient art form that is vital to local communities, passing on history and traditions. With growing tourist interest, innovations like Virtual Reality (VR) shows have emerged, helping to revitalize and sustain the art.

Environmental:

Maintain essential ecological processes: Ecosystems provide essential services, such as natural resource supply and water and air quality regulation, ensuring environmental sustainability. Strong ecological processes support the environment's health and meet present and future human demands. For instance, stakeholders in tourist areas can collaborate to reduce deforestation, preserving ecological

processes like transpiration and photosynthesis. This partnership helps maintain vital ecosystem services, such as water and food supply, contributing to overall environmental sustainability.

Conserve natural heritage and biodiversity: Local communities and governments maintain a pristine environment to attract tourists. Tourism revenue may fund biodiversity protection by establishing protected areas, training staff to manage ecosystems, and running environmental education programs for tourists. The Galapagos National Park in Ecuador charges a US\$100 entrance fee, which helps fund park conservation, maintenance, and hiring of park rangers.

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Stakeholders influence on sustainable tourism development (Governments, international organisations, businesses, locals, tourists)

Government:

Establishing policies and creating plans: Governments can implement policies that stakeholders must follow to minimize environmental damage while maximizing local benefits. For instance, in Sentosa, Singapore, authorities collaborate with stakeholders to create plans aimed at sustainability, such as conserving heritage, protecting biodiversity, and achieving carbon neutrality by 2030.

Enforcing regulations: Governments are crucial in enforcing regulations for sustainable tourism development, including controlling tourism activities and visitor numbers. Such enforcement is vital for adherence to sustainability policies. For example, in Bhutan, tourists must book through licensed operators, who ensure compliance with laws that minimize tourism's negative impacts, such as restricting treks to designated trails to protect local flora.

Limitations:

Poor enforcement: Effective regulations require active enforcement. Governments lacking resources, political influence, or facing corruption may struggle to ensure compliance, hindering sustainable tourism development. For example, Cambodia, which has faced challenges in enforcing environmental regulations due to corruption and lack of resources.

The decision to prioritise economic development: Some governments prioritize economic development over environmental and social sustainability, hindering sustainable tourism. For instance, Mount Everest attracts hundreds of climbers annually, but poor waste disposal enforcement has led to significant pollution. Nepali authorities have not imposed stricter regulations, fearing that such measures could reduce tourist numbers and revenue.

International organisations:

International organizations, including governmental (IGOs) and non-governmental organizations (INGOs), possess the expertise and resources to influence sustainable tourism development by **offering consultancy to countries, provide financial aid, and raise public awareness about contributing to sustainable practices**. For instance, in Ha Tay Province, Vietnam, the United Nations World Tourism Organization (UNWTO):

Offering consultancy and technical assistance: Help local handicraft villages by developing a marketing plan to attract independent travelers and tour operators. They also facilitated handicraft skills training for locals.

Financial assistance: Provided financial assistance for small-scale infrastructure improvements, such as public toilets and information boards to enhance tourism.

Raising public awareness on how they can contribute to sustainable tourism

development: UNESCO's People Protecting Places program informs travelers on how to protect UNESCO World Heritage Sites as tourists. For example, in Wadi Al-Hitan, Egypt, rising tourist numbers threatened delicate fossil remains. With UNESCO's assistance, visitors were advised to stick to designated footpaths, helping to preserve the site's integrity and natural beauty.

Limitations:

Lack of understanding of local contexts: International organizations may include members from different countries and backgrounds, leading to varied perspectives on issues. This lack of local context can result in actions that do not align with community needs, potentially facing local opposition and hindering sustainable tourism development.

Lack of funding: Many international organizations are non-profit, making it challenging to choose which projects to support. Without adequate funding, some plans cannot be implemented, which hinders sustainable tourism development.

Businesses: are motivated to pursue sustainable tourism to maintain profitability by protecting the environment, they can attract returning tourists, ensuring long-term success. They also possess financial resources to influence sustainable tourism development. They can influence sustainable tourism development by:

Seeking advice from other stakeholders regarding sustainable tourism practices

Participating in decision-making for sustainable tourism development: For example, Quicksilver Cruises in Australia specialises in tours of the Great Barrier Reef, it works with the planning authorities to promote ecotourism and a research team of marine biologists which monitors the marine ecosystem to assist planning authorities in managing the Great Barrier Reef.

Limitations:

Compromising on sustainable practices to survive: Businesses may prioritize profits over sustainability, which can hinder sustainable tourism by polluting the environment or exploiting resources.

Differing understanding and ways of measuring sustainability: Different businesses may interpret sustainability and its measurement differently, sometimes leading to greenwashing where they market themselves as sustainable when their practices may not be so.

Locals:

Seeking advice from other stakeholders regarding sustainable tourism practices: Locals may lack the expertise that stakeholders like governments, businesses, and international organisations have in promoting sustainable tourism. By consulting these stakeholders, locals can adopt tried and tested practices to protect the environment and foster sustainable tourism growth. For example, in Singapore, locals can seek guidance from the National Environment Agency on sustainable practices such as waste management and recycling when hosting international events.

Participating in decision-making: having local knowledge and involving locals in decision-making is essential. They can offer insights to reduce tourism's harmful impacts, such as protecting local flora and fauna. This can be done through community-based tourism which prioritises the participation of the local community and ensures tourism benefits stay within the community.

Limitations:

Lacking of financial or technical assistance:Some locals may lack information on how to apply for financial or technical aid,leaving them without enough resources to implement sustainable tourism development plans.

Prioritising economic benefits over sustainability:Some locals may pursue tourism practices that are not sustainable as long as it generates higher income to support their families.

Tourists:

Developing a genuine interest in the tourist destination and seeking to enhance its

environment,culture and economy:Tourists can choose tours and services that prioritise sustainable practices or support environmental conservation.For instance,in Costa Rica,the sea turtle volunteering conservation program allows tourists to care for injured sea turtles and patrol beaches for sea turtles and their nests to protect it from poachers.

Interacting responsibly with the environment and people when they travel:Tourists can learn about local customs and dress appropriately to show respect for cultural practices.For example,in Bali,Indonesia,visitors should dress modestly when visiting religious sites and avoid littering or vandalizing the environment they visit.

Limitations:

Some sustainable tourism options may be out of their budget:Sustainable tourism options may be more expensive due to costs associated with environmental conservation efforts,leading to some tourists to be reluctant to pay these fees.

Lack of clear information,which may confuse tourists on the sustainable tourism options

available:There are different interpretations of “sustainable tourism” and how to measure it,which can lead to confusion for tourists regarding the sustainability of businesses they engage with or their own tourism practices.

Other challenges faced by stakeholders in influencing sustainable tourism development:

Stakeholders may have different understandings and measurements of sustainable tourism

development:Understanding and measuring sustainability differ among places and stakeholders,leading to conflicts that complicate consensus on sustainable tourism development.

Stakeholders have differing amounts of control over resources:Stakeholders have different levels of power and influence.Those with more resources may dominate decisions,overriding other perspectives and hindering sustainable tourism development.

Stakeholders have different priorities which can make negotiation challenging:Stakeholders have differing priorities, complicating negotiations.For instance,locals may want to limit tourist numbers to reduce congestion,while governments might resist this due to concerns about lost tourism revenue.This situation can lead to economic,social,and environmental trade-offs that stakeholders must compromise and accept.

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Effectiveness of different approaches in achieving sustainable tourism development(Eco-tourism,community-based tourism,pro-poor tourism)

Eco-tourism:It occurs in scenic natural areas,allowing tourists to experience nature.It aims to conserve the natural environment while benefiting the local community thus ensuring environmental,economic,and social sustainability.Various stakeholders are often involved,depending on the specific projects undertaken.

Environment:For example,strict regulations are in place at Waitomo Caves to ensure sustainability for future generations.Carbon dioxide levels are monitored to prevent the limestone formations from decaying due to tourists’ and operators’ breathing.Systems track CO2 levels,temperature,air quality,and humidity to

guide ventilation actions. When CO₂ levels rise due to heavy tourist traffic, the caves may be temporarily closed. Additionally, a \$10,000 fine is enforced for anyone who damages the delicate cave formations. Locals benefit economically from tourism at Waitomo Caves through job creation. Regulating tourist numbers ensures long-term tourism, maintaining economic sustainability. CO₂ monitoring and ecosystem preservation uphold environmental sustainability, while local involvement in management supports social sustainability.

Economic: Eco-tourism in Costa Rica generates about USD 1.7 billion annually, contributing around 6% to the country's GDP. It supports 80,000 direct jobs in tourism and creates additional jobs in related sectors such as agriculture and handicrafts. This helps boost the local economy while promoting sustainability.

Social: In Costa Rica, eco-tourism projects have contributed significantly to local social benefits. For example, the Monteverde Cloud Forest Reserve employs local residents and generates revenue that has been reinvested into local infrastructure, including healthcare and education initiatives. Approximately 250,000 tourists visit Monteverde annually, which has helped boost local education projects and improve health services in the area.

Limitations:

Uncertainty over the continuity of efforts in conserving nature: Ecotourism can become problematic when it attracts too many tourists, leading to environmental degradation. High tourist numbers may damage the natural areas that ecotourism aims to protect. For instance, in the Galapagos Islands, an increase in visitors has caused erosion on trails and disturbed local wildlife and plant life. Additionally, oil spills from tour boats have significantly polluted the surrounding waters.

Uncertainty over involving local communities: Demand for manpower to serve tourists can lead some businesses to hire non-locals, especially if locals lack the necessary skills. Without proper training from authorities or businesses, the benefits to local communities are not maximised. For instance, in Kufri, India, economic leakages occur because locals are not equipped with the skills required, resulting in job opportunities going to non-locals.

Community-based tourism: It is a type of innovative small-scale tourism experience that is managed by local communities. It aims to maximise local communities' involvement in tourism and the benefits to them.

Social: Income (CBT) is often reinvested in local schools, improving facilities, educational resources, and teaching staff. In Nepal, CBT initiatives have funded school construction and scholarships, enhancing education quality and promoting literacy and skills development, which are crucial for community growth. For instance, CBT efforts have led to significant educational improvements in rural areas, fostering a more educated population that can contribute to sustainable development.

Economic: In Nepal, (CBT) has been pivotal in creating local jobs, with estimates suggesting that around 25,000 jobs were generated in the tourism sector in 2019. CBT creates jobs that increase local income. Higher earnings enable residents to spend more on goods and services, boosting economic activity within the community.

Environment: (CBT) in Costa Rica has provided significant environmental benefits by protecting endangered species such as the Scarlet Macaw, Green Sea Turtle, and Jaguar. Initiatives include habitat restoration, monitoring nesting sites, and promoting eco-friendly practices among tourists and locals. These efforts raise awareness about biodiversity and encourage sustainable practices that help preserve critical ecosystems.

Limitations:

Loss of culture: Without sufficient measures, when local communities offer tourism experiences out of their cultures, it may result in commodification, resulting in the loss of authenticity of their cultures. For

example, in Kyrgyzstan, CBT projects have seen traditional yurts commodified with beds and modern furniture to enhance comfort and meet tourist expectations.

Competition with large-scale tourism development: Local communities often lack the skills and finances needed to develop their tourism industry. Many struggle with communication and marketing, making it hard to compete with larger tourism operations that have more resources. For example, while Thanh Ha Pottery Village in Vietnam attracts tourists interested in local culture, it faces tough competition from better-established pottery villages due to a shortage of skilled artisans and limited marketing capabilities.

Pro-poor tourism: (PPT) focuses on improving the livelihoods of the poor by providing training and access to micro-finance. Its goal is to generate net benefits and enhance the well-being of the poor.

Economic: In northern Ghana, micro-finance programs have enabled local women to start tourism-related businesses such as handicraft production and guesthouse management. These ventures have led to increased household income and greater financial independence. Some communities reported a 20-30% increase in family income due to these activities.

Social: In Kenya's Maasai Mara, PPT initiatives have trained locals in guiding and managing eco-lodges. These projects not only generated income but also enhance local pride and social cohesion, as residents actively preserve their culture while engaging in tourism.

Environment: In South Africa's Maputaland region, Wilderness Safaris engages local communities in wildlife conservation through (PPT). This approach not only helps protect ecosystems but also enables locals to earn income through eco-tourism ventures, such as guiding and managing eco-lodges. By generating revenue from conservation efforts, communities benefit economically while fostering environmental stewardship.

Limitations:

The inability to significantly reduce poverty as compared to direct investment in social services: Channelling benefits to the poor can be difficult compared to direct investment in social services. Many individuals may be hesitant to participate in (PPT) or may lack the skills, finances, and knowledge necessary to establish and sustain their businesses.

For example, in Abr, Iran, many locals lack the skills and confidence to participate in training programs. Some training requires fees, discouraging participation due to their bleak outlook on the tourism industry. As a result, many remain unskilled and do not engage with tourism opportunities, leading to low involvement from the poor.

The economic benefits may be highly unevenly distributed, with most of the benefits being channelled to non-poor locals: Non-poor locals typically have better access to micro-financing and grants for tourism, often due to their perceived reliability by banks and donors. This allows them to capitalize more effectively on tourism opportunities, leading to greater wealth. Consequently, the benefits of (PPT) tend to favor these non-poor individuals, while the poorest community members receive only marginal benefits. This dynamic widens the income gap, making the overall impact of PPT insufficient for significantly improving the lives of the poor. To address these disparities, prioritizing direct investments in social services such as education and healthcare by authorities and NGOs may be more effective.

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